Heliophysics Subcommittee

Senior Review Discussion

July 2nd, 2012

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Outline

- What is MO & DA?
- What is the Senior Review (SR)?
  – Senior Review Charter
  – The Roadmap and the Great HP Observatory
  – Budgets
  – International Agreements
  – Additional Information (E/PO, Legacy Archives, etc.)
  – The Evaluation and Report

Heliophysics MO&DA Elements

MO&DA for current mission suite

Guest Investigator Program

Data and Modeling Services:

- SDAC and VSO,
- SPDF (e.g. CDAWeb, OMNIWeb, etc.),
- VxOs, Resident archives,
- CCMC

Multimission Operations Project at GSFC:

- Concentrates on control center functions and flight dynamics
- Sustain operations infrastructure (comm., and DSN interfaces)
- Supports Conjunction Assessment
- Promote new operations tools and architectures (level of effort)
- Supports <u>all</u> space science operations at GSFC

The Senior Review Paradigm

NASA's Science Mission Directorate (SMD) periodically conducts comparative reviews of Mission Operations and Data Analysis (MO&DA) programs to maximize the scientific return from these programs within finite resources. The acronym "MO&DA" encompasses operating missions, data analysis from current and past missions, and supporting science data processing and archive centers. NASA uses the findings from these comparative reviews to define an implementation strategy and give programmatic direction to the missions and projects concerned for the next two to four fiscal years.

Note: as this is a procurement, and as such, the rules for conflicts of interest, especially financial, are applicable.

Mission Extension Paradigm

- The following provide the standard guidelines for budgets for mission extensions beyond the prime mission lifetime:

  - bare-bones mission operation and science operations: Compared to the prime mission phase, a significantly higher risk and lower data collection efficiency will be accepted during any mission extension, and this portion of the MO&DA budget for the extended phase shall have a funding level of roughly one-half (50%) of the equivalent portion during the prime mission phase;
  - bare-bones data handling, including low-level processing and basic archiving: Compared to the prime mission phase, fewer services will be offered to Guest Observers and Guest Investigators who are assumed to have become more knowledgeable during the mission's prime phase, and this portion of the MO&DA budget for the extended phase shall also have a funding level of roughly one-half of the equivalent portion during the prime mission phase;
  - minimal science data analysis to maintain understanding of the instrument performance, to monitor progress toward accomplishing the objectives of science observations, and to involve the science community in formulating the mission observing program to make the best scientific use of NASA's Heliophysics missions; however, no funds will be available in this "minimal-science analysis mode" for detailed analysis, data fitting, modeling, and interpretation; and,
  - for science data centers: basic, bare-bones operation, including data ingest and validation, distribution of science data and software products, and other value-added services.

2013 Heliophysics Senior Review (1)

Venue: Undisclosed Locale in the Metro DC area. Definite Date, 2013

Charge to panel:

(1) In the context of the Heliophysics research objectives and focus areas described in the SMD Science Plan, rank the scientific merits - on a "science per dollar" basis - of the expected returns from the projects reviewed during FY14 and FY15. The scientific merits include relevancy to the Heliophysics research objectives and focus areas, scientific impact and promise of future scientific impact.

(2) Assess the cost efficiency, data availability and usability, and vitality of the mission's science team as secondary evaluation criteria, after science merit.

(3) Drawing on (1) and (2), provide comments on an implementation strategy for the MO&DA program for 2014 and 2015 which could include a mix of:

- Continuation of projects "as currently baselined";
- Continuation of projects with either enhancements or reductions to the current baseline;
- Mission extensions beyond the prime mission phase, subject to the "Mission Extension Paradigm"; or
- Project termination.

(4), (5) and (6): Make preliminary assessments equivalent to (1), (2), and (3) for the period 2016, 2017, and 2018.

(7) Provide on overall assessment of the strength and ability of the MO&DA program to meet the expectations of the Heliophysics System Observatory during 2013 to 2018, as represented in the SMD Science Plan and in The Heliophysics Science and Technology Roadmap.

2013 Heliophysics Senior Review (2)

Proposal content:

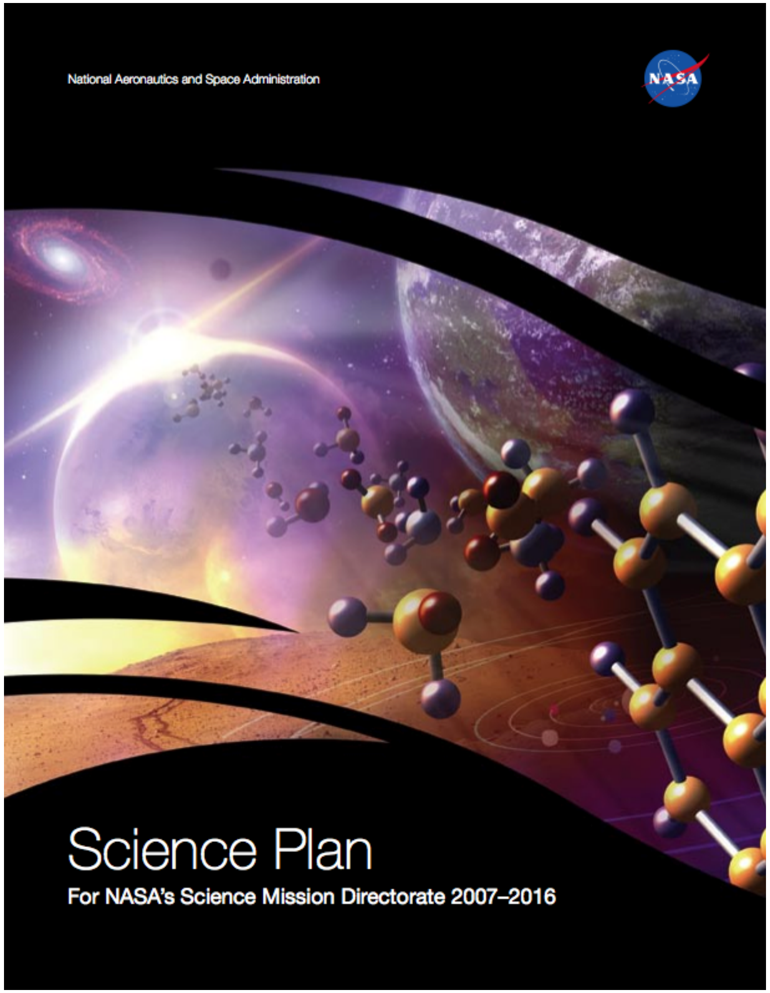
The SMD Science Plan incorporates the Heliophysics System Observatory as integral element of strategic plan of the Heliophysics science area. The 2009 Roadmap provides a series of open science questions that could be addressed by the continuation of specific assets of the System Observatory. The proposals need to discuss each mission's potential for elucidating such answers during FY13 to FY18 in each of these areas:

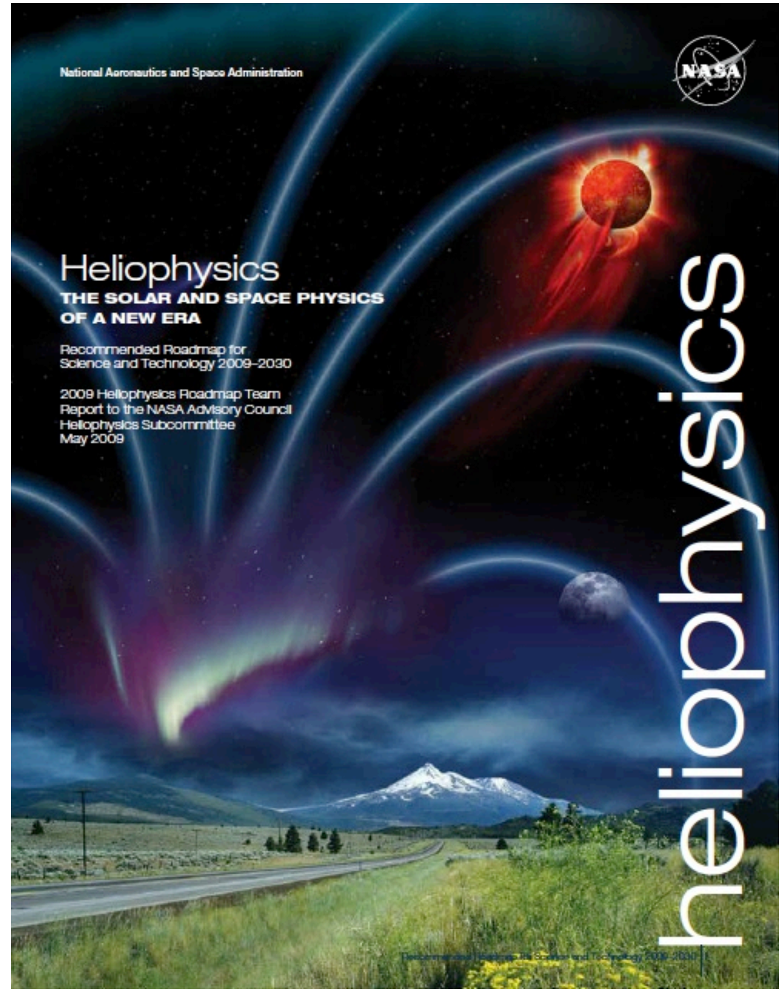
- Relevance to the stated Heliophysics research objectives and focus areas;
- Impact of scientific results as evidenced by literature citations, press releases, etc.;
- Broad accessibility and usability of the data;
- Spacecraft and instrument health;
- Productivity and vitality of the science team (e.g., publishable research, training younger scientists, etc.);
- Promise of future impact and productivity (due to uniqueness of orbit and location, solar cycle phase, etc.).

The proposal shall contain a science section, a technical/budget section, a <u>mandatory</u> legacy science data archiving and migration plan to a final archive, a <u>mandatory</u> description of the intended E/PO project (where applicable), a list of acronyms, and a budget supplied on a standard spreadsheet (provided). The scientific, the technical/budget, legacy mission archive plan, and E/PO sections should be no more than 30 pages of writing and graphics.

Note that under this Call for Proposals, HQ will not solicit or accept so-called "Optimal" budget proposals. All missions participating in the 2013 Senior Review are required to submit proposals that are "In-Guideline". The only overguides permitted would be to establish guidelines where none currently exist.

Strategic Goals and Objectives





SMD Strategic Plan

Heliophysics Research Objectives and Focus Areas

Research Objectives	Specific Research Focus Areas
Open the Frontier to Space Environment Prediction: Understand the fundamental physical processes of the space environment from the Sun to Earth, to other planets, and beyond to the interstellar medium	• Understand magnetic reconnection as revealed in solar flares, coronal mass ejections, and geospace storms • Understand the plasma processes that accelerate and transport particles • Understand the coupling between planetary ionospheres and their upper atmospheres mediated by strong ion-neutral interactions • Understand the creation and variability of magnetic dynamos and how they drive the dynamics of solar, planetary and stellar environments
Understand the Nature of Our Home in Space: Understand how human society, technological systems, and the habitability of planets are affected by solar variability and planetary magnetic fields	• Understand the causes and subsequent evolution of solar activity that affects Earth's space climate and environment • Determine changes in the Earth's magnetosphere, ionosphere, and upper atmosphere to enable specification, prediction, and mitigation of their effects • Understand the role of the Sun as an energy source to Earth's atmosphere and, in particular, the role of solar variability in driving change • Apply our understanding of space plasma physics to the roles of stellar activity and magnetic shielding in planetary system evolution and habitability
Safeguard the Journey of Exploration: Maximize the safety and productivity of human and robotic explorers by developing the capability to predict the extreme and dynamic conditions in space	• Characterize the variability, extremes, and boundary conditions of the space environments that will be encountered by human and robotic explorers • Develop the capability to predict the origin and onset of solar activity and disturbances associated with potentially hazardous space weather events • Develop the capability to predict the propagation and evolution of solar disturbances to enable safe travel for human and robotic explorers • Understand and characterize space weather effects on and within planetary environments to minimize risk in exploration activities

Open the Frontier to Space Environment Prediction

- *Understand the fundamental physical processes of the space environment - from the Sun to Earth, to other planets, and beyond to the interstellar medium.*
  - **F1.Understand magnetic reconnection as revealed in solar flares, coronal mass ejections, and geospace storms.**
  - **F2. Understand the plasma processes that accelerate and transport particles.**
  - **F3. Understand the role of plasma and neutral interactions in nonlinear coupling of regions throughout the solar system.**
  - **F4. Understand the creation and variability of magnetic dynamos and how they drive the dynamics of solar, planetary and stellar environments.**

Understand the Nature of Our Home in Space

- *Understand how human society, technological systems, and the habitability of planets are affected by solar variability and planetary magnetic fields.*
  - **H1. Understand the causes and subsequent evolution of solar activity that affects Earth's space climate and environment.**
  - **H2. Determine changes in the Earth's magnetosphere, ionosphere, and upper atmosphere to enable specification, prediction, and mitigation of their effects.**
  - **H3. Understand the role of the Sun as an energy source to Earth's atmosphere, and in particular the role of solar variability in driving change.**
  - **H4. Apply our understanding of space plasma physics to the role of stellar activity and magnetic shielding in planetary system evolution and habitability.**

Safeguard the Journey of Exploration

- *Maximize the safety and productivity of human and robotic explorers by developing the capability to predict the extreme and dynamic conditions in space.*
  - **J1. Characterize the variability, extremes, and boundary conditions of the space environments that will be encountered by human and robotic explorers.**
  - **J2. Develop the capability to predict the origin and onset of solar activity and disturbances associated with potentially hazardous space weather events.**
  - **J3. Develop the capability to predict the propagation and evolution of solar disturbances to enable safe travel for human and robotic explorers.**
  - **J4. Understand and characterize the space weather effects on and within planetary environments to minimize risk in exploration activities.**

Heliophysics System Observatory

The Heliophysics System Observatory will continue to evolve as new spacecraft join and older ones retire or change their operating modes. Missions both in their prime phase and in extended phases (supported by the Heliophysics MO&DA program) provide the variety of observation posts needed to study Sun-Solar System connections, as demonstrated by the 2003 Halloween Storms. A great strength of this fleet is that it is periodically evaluated and reviewed to maximize the return on the agency's investments.

The Senior Review process helps to inform NASA which spacecraft are most necessary to meet the needs of the Heliophysics program as defined by the community-developed Strategic Roadmap.

Continuing membership in the System Observatory

- The criteria for continuation include:
  - relevance to the goals of the Heliophysics Division; => Prime
  - impact of scientific results as evidenced by citations, press events, etc.; => Prime
  - spacecraft and instrument health; => Prime
  - productivity and vitality of the science team (e.g., publishable research, training of younger scientists, education and public outreach); => Secondary
  - promise of future impact and productivity (due to uniqueness of orbit and location, solar cycle phase, etc.); and => Prime
  - broad accessibility and usability of the data. => Prime

- Items marked as Secondary are secondary evaluation criteria after scientific merit (of Prime importance).

Sample Evaluation Template

- HP MO&DA Senior Review 2013
  - (This lists the content; assume 2-3 pages per evaluation report)

- Project Name:____
- Writers: _________________ , __________________, _______________

- Overview on the Science Plan:
- Science Strengths;
- Relevancy Strengths to HP Research Objectives;
- Value to the HP Great Observatory;
- Spacecraft / Instrument health and status;
- Data operations (accessibility, quality control, archiving);
- E/PO strengths and weaknesses;
- Proposal Weaknesses;
- Overall assessment and findings.

‘In kind costs’

- FY13 – FY18 '5-way' Breakdown for In-Kind contributions:
  - Show the 'cost' attributions for employing NASA tracking services such as the DSN, Ground Network, or TDRSS and other support not included in the 'full cost' representation of your budget.
  - These include support from the JPL AMMOS project and any GSFC/SSMO multi-mission support not directly charged to the project's account.
  - Not include any costs that would be paid out of project accounts; those would tallied in the other tables.
  - Representations of direct or in-kind funding from international partners or from other US Government agencies should not be provided.

Budget Outlook

Projected Funding:

Due to the reduced funding levels projected compared to earlier years, and the impact of new missions moving from their prime mission phase to the extended mission budget, the latter will be under-funded, starting in FY2011.

This projected funding shortfall will severely impact the capabilities of the System Observatory and its ability to properly address the goals of the NASA Heliophysics program.

This under-funding of the System Observatory occurs at a particularly inopportune time: at the start of the next solar maximum (after a very pronounced minimum). This will have an impact on the study of the many diverse phenomena of solar-terrestrial events outlined in the previous decadal survey.

Principle International Agreements

- ESA
  - Cluster
    - ESA Funding is approved to Dec 2014.
    - NASA and ESA have extended the MOU to December 31, 2016.
  - SOHO
    - ESA funding approved to December 2014.
    - MOU extend to December 31, 2016.
- JAXA/ISAS
  - Geotail
    - MOU has no termination date.
    - Either party may terminate with 180 days notification.
  - Hinode

Additional Information

- Bibliographies: Each proposal lists key references plus providing URLs to project bibliographies.
- Mission Archive Plans (required, minimum 5 pages):
  - Continuing emphasis are the production and review of Mission Archive Plans.
  - Must show how data conforms to the Heliophysics Data Policy.
  - A "Virtual Data Panel" to assessed these MAPs.
  - Results to be presented during meeting as input to overall review.
- Review of EPO plans and projects (required, minimum 5 pages).
  - Each science proposal has an EPO summary and budgets reserve about 1-2% for EPO.
  - Must demonstrate activities are conforming to the new SMD policy on E/PO (SPD-18).
  - A separate panel of E/PO SMEs is held to review these elements.
  - Results to be presented to the SR as input to overall review (typically the briefing to the SR panel is done by the SMD Lead for E/PO).

Suggested Outline for the Report

- Overview
- General Findings (review process, principles)
- Assessment of the HP MO&DA program structure and balance
- Rankings of the project proposals on science merit and relevance
- Project-by-Project Assessments of science merit and relevance; each should contain finding on the
  - Science strengths
  - Relevancy strengths
  - Contribution to the System Observatory
  - Legacy Archive merit
  - E/PO merit
  - Overall assessment
- Summary of assessments

SR 2013 proposed schedule

Draft CfP to missions: October 2012

Final CfP to missions: November 2012

Proposals Due: early February 2013

SR panel meets in DC area: April 2013

SR panel ‘polishes’ this report and delivers to HQ: mid-May 2013

Report briefed to Helio Division management: May 2013

Report and findings briefed to SMD AA: May 2013

HP releases the report: June 2013

HP sends letters to each mission with recommendations, revised guidance, special instructions, etc.: late June 2013

- Consult with foreign partners about results
- Consult with the Heliophysics Subcommittee

Missions have 60 days to respond with plan to meet new ‘guidance’ and Instructions (*i.e.* by the beginning of the new FY).

Back Up

Example from SR10: The Budget Climate

Totals (in $k) and subtotals may not sum precisely due to rounding.	2010 Enacted	BY (2011)	BY + 1 (2012)	BY + 2 (2013)	BY + 3 (2014)	BY + 4 (2015)
Heliophysics	**$627,369**	**$641,893**	**$647,624**	**$679,835**	**$704,393**	**$750,831**
Heliophysics Research	***$172,990***	***$166,927***	***$165,401***	***$168,741***	***$172,880***	***$172,875***
Voyager	$3,761	$4,808	$4,856	$4,905	$4,954	$5,073
SOHO	$1,500	$2,682	$2,101	$2,200	$2,289	$1,979
WIND	$2,200	$2,200	$2,200	$2,300	$2,400	$2,400
GEOTAIL	$500	$0	$0	$0	$0	$0
CLUSTER-II	$4,000	$1,000	$500	$0	$0	$0
ACE	$3,000	$3,800	$3,800	$3,900	$4,000	$4,000
RHESSI	$2,000	$2,000	$2,000	$2,100	$2,200	$2,200
TIMED	$4,000	$3,499	$3,499	$3,599	$3,699	$3,699
Hinode (Solar B)	$12,398	$7,992	$7,991	$7,991	$8,195	$8,195
IBEX	$6,866	$4,515	$4,000	$4,000	$4,000	$4,000
TWINS	$1,531	$1,000	$1,000	$1,000	$750	$750
CINDI	$1,500	$904	$0	$0	$0	$0
AIM	$4,000	$3,500	$3,000	$3,000	$3,072	$3,072
THEMIS	$6,500	$6,787	$6,836	$5,548	$5,536	$5,525
STEREO	$10,700	$10,000	$10,000	$10,000	$10,240	$10,240
Total MO & DA:	**$64,456**	**$54,687**	**$51,783**	**$50,543**	**$51,335**	**$51,133**
Solar Dynamics Observatory (SDO)	$34,100	$20,650	$16,135	$16,301	$14,234	$9,632
Total missions:	**$98,556**	**$75,337**	**$67,918**	**$66,844**	**$65,569**	**$60,765**
SOLAR Data Center	$870	$800	$819	$839	$859	$871
SEC Data & Modeling Services	$3,754	$3,725	$3,734	$3,743	$3,752	$3,802
Space Physics Data Archive	$1,325	$1,341	$1,366	$1,399	$1,433	$1,452
SEC Guest Investigator Program	$8,644	$17,744	$17,551	$16,599	$16,592	$14,711
CCMC	$1,706	$1,750	$1,786	$1,829	$1,873	$1,898
SSC MO Services	$5,608	$10,180	$10,446	$11,085	$11,362	$11,704
Total archives/Ops/GIP:	**$21,907**	**$35,540**	**$35,702**	**$35,494**	**$35,871**	**$34,438**
Total budget:	**$120,463**	**$110,877**	**$103,620**	**$102,338**	**$101,440**	**$95,203**

Example from SR10: The Budget Climate (2)

MO & DA budgets submitted for SR	2010	2011	2012	2013	2014	2015
Heliopysics						
Heliophysics Research						
Voyager	$3,761	$4,808	$4,856	$4,905	$4,955	$5,073
SOHO	$1,500	$2,682	$2,641	$2,684	$2,728	$2,500
WIND	$2,200	$2,200	$2,200	$2,300	$2,400	$2,400
GEOTAIL	$500	$145	$145	$145	$0	$0
CLUSTER-II	$4,000	$3,397	$3,394	$2,262	$2,244	$0
ACE	$3,000	$3,800	$3,800	$3,900	$4,000	$4,000
RHESSI	$2,000	$2,000	$2,000	$2,100	$2,200	$2,200
TIMED	$4,000	$3,499	$3,499	$3,599	$3,699	$3,699
Hinode (Solar B)	$12,398	$7,992	$7,991	$7,991	$8,195	$8,195
IBEX	$6,866	$4,515	$4,000	$4,000	$4,000	$4,000
TWINS	$1,531	$1,000	$1,000	$1,000	$750	$750
CINDI	$1,500	$1,280	$1,080	$800	$800	$0
AIM	$4,000	$3,500	$3,000	$3,000	$3,072	$3,072
THEMIS	$6,500	$6,787	$6,836	$5,548	$5,536	$5,525
Artemis	$0	$1,850	$1,421	$645	$625	$0
STEREO	$10,700	$10,000	$10,000	$10,000	$10,240	$10,240
Total MO & DA:	**$64,456**	**$59,455**	**$57,863**	**$54,879**	**$55,444**	**$51,654**
FY10 President's Submit (plan)	**$64,456**	**$54,687**	**$51,783**	**$50,543**	**$51,335**	**$51,133**
DELTA (request-plan):	**$0**	**$4,768**	**$6,080**	**$4,336**	**$4,109**	**$521**
DETLA (w/o Artemis):	***0***	***$2,918***	***$4,659***	***$3,691***	***$3,484***	***$521***

Changes from FY10 submit